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JULY 2.

Mr. THOMAS MEEHAN, Vice-President, in the chair.

Nine persons present.

The following papers were presented for publication:—

"Nomenclature and Check-List of North American Land Mollusks." By H. A. Pilsbry.

"The Origin and Meaning of Sex." By John A. Ryder.

"A review of the American Species of Sturgeons (Accipenseridae)." By Philip H. Kirsch and Morton W. Fordice.

JULY 9.

Rev. H. C. MCCOOK, D. D., Vice-President, in the chair.

Twenty persons present.

Note on the true Systematic Position of the Ray Spider.—Dr. HENRY C. MCCOOK remarked that he had been recently led to reinvestigate the character of the web of the Ray spider and its proper systematic place.

When the snare of this aranead was first discovered by him in 1881, and described in the Proceedings of this Academy[1] he considered the spider new to science, and gave it the name of *Epeira radiosa* in a paper containing a careful and detailed description of its spinningwork and habits. He then indicated that it would probably be assigned to a new genus, and subsequently in a verbal communication to this Academy, proposed for it the name of *Actis radiosa.* Emerton, in his monograph of the New England Epeiradæ, created for it the genus *Microepeira.*[2] Subsequent investigation had led Dr. McCook to believe that the spider belongs to Cambridge's genus *Theridiosoma,*[3] and probably is identical with the European species *Theridiosoma gemmosum* of Dr. L. Koch.[4] This genus has a marked resemblance to *Epeira,* as Cambridge himself allows, and certainly on the ground of structure appears to be at least equally related to the Epeiroids.

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[1] Proc. Acad. Natural Sciences. Phila., 1881, pp. 163–75.

[2] New England Spider of the Family Epeiradæ. Transactions Connecticut Academy, Volume VI., 1884, p. 320.

[3] Rev. O. Pickard-Cambridge, Annals and Magazine of Natural History, 1879, p. 193.

[4] Theridium gemmosum: Verzeichniss der bei Nurnberg beob. Arten. p. 69.

Count Keyserling, however, in his extended and admirable monograph[1] retains the species among the Retitelariæ where it had previously been placed. But the spinningwork of the spider, which appears to have been unknown to the above named arachnologists, shows conclusively that it must be placed with the Orbitelariæ. To that position, therefore, Dr. McCook assigned it, and it became necessary to transfer the genus *Theridiosoma* from the Retitelariæ to the Orbitelariæ, and to make for it a new family, for which he proposed the name *Actinæ.*

In the paper above alluded to, in which the habits and spinningwork of this spider were originally described, the statement was made that the spiral lines of its web were covered with viscid beads. Upon this point turned very largely the decision as to the true systematic place of the spider, for it has never yet been observed that any other spiders than those belonging to the Orbitelariæ make geometric webs that are habitually covered with viscid beads as the ordinary armature for capturing prey. In correspondence with arachnologists upon the subject, the speaker was not able to say that he had made such tests of this point as to enable him to speak with absolute assurance. He had made a somewhat careful investigation with a good hand lens, which seemed to indicate with reasonable certainty the presence of viscid spirals. But as the webs are habitually located within cavities and shaded positions, where they are extremely difficult to study, there remained the possibility that he might have been mistaken. This appeared to be the more likely because when such webs as those of the Triangle spider, *Hyptiotes cavatus*, are examined, the spiral lines often appear to be beaded, although it is well known that they have no viscid armature. The lack of beads is supplied by a thin flocculent thread, which is teased or hackled by a special instrument known as the calamistrum. Yet, when one looks at the spiral thread of *Hyptiotes*, or of *Uloborus*, which has the same peculiarity, he finds that it presents to a careless glance the appearance of being beaded. More closely examined, however, these seeming beads prove to be nothing but globular grains of pollen or particles of dust which have been drifted upon and entangled with the flocculent lines. The speaker had himself more than once been deceived by the strong resemblance of these drifted minutiæ, and been led to look again with the wonder whether after all there might not be beads upon these webs which were so well known to be unbeaded? When, therefore, the question was raised and became of such special importance, he resolved to make a careful and thorough re-examination and test of this point.

No opportunity occurred to do this successfully until July 8th (1889), near Wallingford, Delaware County, Pennsylvania. The Ray spider was found in sufficient abundance for desired study, located along the banks of a little run or stream of spring water. Its position was there precisely like that in which it has always been discovered, in cool, shaded retreats overhanging or close to running water. He had provided himself with all the apparatus necessary to make a satisfactory microscopic examination of the webs. Many of his previous investigations were repeated and confirmed. The viscid globules were found to be visible along the spiral lines with a common hand lens. Not satisfied with this, portions of the web were removed and microscopically examined, and thus displayed beyond doubt the presence of the viscid beads.

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[1] Die Spinnen Amerikas. Theridiidae, I Hälfte, von Graf. E. Keyserling, Zweiter Band, p. 218.

The behavior of the web was precisely like similar portions of the orb of *Epeira*. The beads would melt upon the glass, leaving the thread visible as a straight line. Within the cups or frames, upon which the lines were taken for examination, the beads being undisturbed were readily examined and their character easily determined. Drawings were made of these beads, and the number counted on single strings, amounting in one case to sixty-four. A number of insects entangled upon several snares were also observed and drawings made. They showed in every instance the same method of entanglement as that so frequently observed upon the web of *Epeira*. The feet, wings and antennæ of a fly were caught in the viscid lines from which, at certain parts, the gummy material had been absorbed into the pubescence of the insect's limbs, and at other parts remained in the globular form of beads.

Dr. McCook not only satisfied himself beyond question of this fact, but submitted the various tests, independently, to his private secretary, Mr. Edwin S. Gault, who had been requested to carefully note and accurately report precisely what he saw. His report confirmed in every particular as to the beaded nature of the spirals, that which is here submitted. Thus the one point which remained at least open to question concerning the spinning habit of this interesting spider, has been placed beyond doubt. Thus also, the position of *Theridiosoma radiosum*[1] is placed beyond doubt among the Orbweavers. The special interest of this decision rests upon the fact that the spinningwork of the Ray spider forms a remarkable connecting link between that of the Triangle spider *Hyptiotes*, and the ordinary geometric Orbweaver. The Triangle spider spins a snare composed of four converging lines and uniting finally in a common supporting thread known as the trap-line. They are joined by cross lines after the manner of the spiral concentrics of an orbicular web, but without any viscid armature as has been stated.

This web is used for the capture of insects by a method of trapping or springing the snare, which has been fully described by various observers, particularly by Professor Burt Wilder. The spider takes its position upon the handle or trapline of its little rayformed web, holding between its fore feet and the third pair of feet a coil of slack line. When an insect strikes its snare it quickly unlooses its fore feet, and the web shoots forward the distance of the coil of slack line. It is then rapidly gathered up again and successively snapped in this wise until the insect is thoroughly entangled.

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[1] Dr. McCook preferred for the present thus to characterize the spider, awaiting until its actual identity with Dr. Koch's species shall be determined. He had no species of the European *Theridiosoma gemmosum* with which to compare his own specimens and had sent specimens to Europe for such comparison.

Now, this same method of springing its net and trapping its prey is habitual with *Theridiosoma radiosum.* Its web may be said to be composed of a series of rays somewhat resembling the orb sector of the Triangle spider. The handles or traplines of these rays are, however, all centered upon a common thread or trapline, which the little weaver holds within her feet. She has the power of springing or snapping off all these combined concentrics at once; or, if she so choose, to spring one or more of them at a time. She thus in this remarkable and essential particular resembles the Triangle spider in her habit. Had the spiral lines of her web proved to be of the same character as those of the Triangle spider, this peculiarity of combining the rays upon a central point might not have seemed so remarkable; but when it is found that the spiral lines are covered with beads entirely after the manner of true Orbweaving spiders, the combination becomes very striking and remarkable indeed.

Many Orbweavers do use a trapline in connection with their webs. This is almost invariably the custom with those which make an orb having in the upper part an open segment, as is the case with *Epeira triaranea, Epeira thaddeus* and generally with the species of the genus *Zilla.* But this trapline, while it is attached to the center of the orb, and assists to hold the various converging lines taut, has simply these two uses: first, it is used as a telegraphic line along which pass the vibrations of the entangled insect, and which are thus communicated to the owner of the snare who occupies a position in a little den just above and beyond her domain. Second, the trapline serves as a gangway along which the spider runs first to the center of her orb and then to the point where her prey happens to be entangled. None of these Orbweavers, however, make any such use of their traplines as that which has been described as habitual to the Triangle and Ray spiders. Perhaps one may not be able to suggest a method by which these variations have been originated, but at all events, it must be conceded that the fact, which is in this communication placed beyond question, as to the viscid character of the spiral lines of the Ray spider's snare, certainly reveals a connecting link between two forms of spinningwork, namely that of the Triangle spider and that of the typical geometric Orbweaver, which had heretofore been supposed to stand at the opposite extremes of the spinningwork of a great family, without any known connection between the two.